

'Towards climate-smart agriculture: Identifying and assessing triple wins for food security, adaptation and mitigation'

Experiences from research for policy support in Ethiopia

Africa faces multiple challenges related to reducing food insecurity, degrading ecosystems and adapting to climate change. With its strong dependency on the natural resources base, African agriculture is particularly vulnerable to climate change. Yet, for food-insecure Africa, agricultural growth remains fundamental to alleviate poverty and promote economic growth. The challenge agriculture faces is to develop food systems that are economically viable and socially acceptable, that achieve the challenge of food security, have a favourable greenhouse gas (GHG) balance and that are adapted to future climate conditions. But how can we identify and assess promising options that address these triple imperatives? What can policy makers and researchers do to enable smallholder farmers to develop and benefit from triple win options? This policy brief presents the experiences and key messages from a Netherlands policy-support research project on sustainable agricultural strategies in a climate change context in Ethiopia.



Key messages

- Combining sustainable development and food security objectives with climate change mitigation and adaptation options provides an integrated way forward. Access to credit and labour availability are a prerequisite for resource-poor smallholder farmers to be able to engage in such triple win options.
- Policy makers need new decision-support tools to assess synergies and trade-offs between development, food security and climate objectives, and the strengthening of formal and informal institutions to increase the adaptive capacity of smallholder farmers to address the negative impacts of climate change. Market development and access, and security of land tenure are essential for the adaptive capacity of smallholder farmers.
- In rain-fed (low external input) agricultural systems, increasing crop yields using nitrogen fertilizers will lead to an increase in GHG emissions. Such trade-offs have to be acknowledged in the perspective of the global context, where developing countries produce significantly less GHG and are facing huge challenges to feed their population.
- Participatory research approaches fully engaging smallholder farmers are recommended to favour the identification and development of triple win options that meet their aspirations and local realities. It is also an effective method to integrate local adaptation practices and triple win options to national level policies.
- Research capacity should be aligned to start a learning process with smallholder farmers and policy makers in order to identify synergies and trade-offs between sustainable development, food security and climate objectives. This can start with the documentation of best triple win practices as an inspiration source for learning and up-scaling purposes.

Smallholder farmers in the context of climate change

In Ethiopia and elsewhere in Africa, smallholder rain-fed farmers are most vulnerable to the impacts of climate change. Research implemented by the Horn of Africa Regional Environment Centre and Network in 13 research sites across Ethiopia (Tröger et al., 2011) shows the negative effects of climate change on mixed farming systems (i.e. crop production and animal breeding) on which most smallholder farmers depend for their livelihoods. Farming has become more difficult and risky due to the unpredictability in seasonal rainfall patterns. Heat, as well as frost in some areas, and lack of water at crucial times in the growing cycle are serious problems that climate change seems to be exacerbating. Though there is considerable geographical variance, in some places farmers suffer complete and repeated harvest failure. Poor crop yields not only reduce the food available for households, but also result in erosion of social structures and a lack of crop residues for feeding the animals. Smallholder farmers have limited access to information, education, new technologies and credit. Their own limited reserves are often insufficient to bridge a poor harvest, and they require external support to master the long-term challenges of climate change. While smallholder rain-fed farmers are the most vulnerable to climate change, they also present the biggest opportunity for increasing agricultural production. The increasing world population and changing diets will create additional challenges for food security. These prospects demand an increase of food production, which needs to be achieved by intensification of areas with currently relatively low agricultural productivity levels. In Ethiopia, over 80% of the population depends on agriculture for their livelihoods, while agriculture accounts for over half of its national GDP. These farmers present the biggest opportunity for Ethiopia's economic development.

The Central Rift Valley hotspot research

The Central Rift Valley is 150km south-west of Addis Ababa and bounded to the east and west by highlands. The valley floor at about 1,500m above MSL consists of a chain of three large lakes connected by rivers. Annual rainfall at the valley floor is about 700mm, of which approximately 70% falls during a short rainy season between June and October. Associated with the low and unreliable rainfall, the productivity of rain-fed agriculture – the predominant livelihood – is very low. Part of the farming population depends structurally on aid provided through the Productive Safety Net Programme, indicating extreme poverty and food insecurity. Recently, the Central Rift Valley has become a centre of economic growth, mainly thanks to the expansion of irrigated horticulture. This adaptation to low and variable rainfall seems successful but there is well-grounded concern that this development is unsustainable. Water tables of rivers and lakes are already dropping due to water extraction associated with the expansion of irrigation, while an increase of water pollution is expected related to the misuse of agro-chemicals in horticulture. Since water resources are limited, rain-fed production will remain a major livelihood for the majority of the population in the near future. Climate scenarios indicate that the length of the rainy season will decrease and the variation in annual rainfall will increase, having a profound negative

The Sustainable Agricultural Strategies in a Climate Change Context in Ethiopia project (BO-009-107) is funded by the Netherlands Ministry of Economic Affairs, Agriculture and Innovation. It is being implemented in close consultation with the Netherlands Agricultural Council in Addis Ababa. It is a collaborative effort between Wageningen UR, the Service for Land and Water Management in the Netherlands and the Horn of Africa Regional Environment Centre and Network in Ethiopia. The project aims to contribute to mainstreaming climate change adaptation into the agricultural and development policies in Ethiopia. Activities include: (1) Capacity building: regional training on adaptation to climate change in agriculture and natural resource management (2009-2011); (2) Case study research in the Central Rift Valley (2010-2011); and (3) Development of a framework for assessing triple win options contributing to the triple goals of for food security, adaptation and mitigation (2011)



impact on rain-fed farming systems. Hence, resource-poor rain-fed farming systems are most vulnerable to the impacts of climate change.

Research on identifying and assessing triple win options in the Central Rift Valley has been carried out along three tracks:

- a community-based study on climate change impacts and opportunities and constraints for adaptation of current rain-fed farming systems to climate change,
- the application of a bioeconomic model for a typical farm household to assess triple win options, and
- action-oriented research with local stakeholders to develop a multi-functional buffer zone combining social-cultural, economic and ecological goals (people, planet, profit).

All three tracks have in common that they link current land-use and short-term options for climate adaptation, climate mitigation and food and income security with long-term hazards of climate change.

Community-based research on climate change impacts and opportunities

The community-based study showed that erratic rainfall has decreased agricultural productivity of rain-fed farmers in recent years. As a consequence, the community developed alternative livelihood strategies such as cattle trading, fattening of goats, off-farm employment and charcoal making. However, reduced water availability affects labour availability as the collection of water and fodder are labour demanding. In addition, the low production contributes to malnutrition of households, affecting the health of the household members and therefore the amount of labour available. Current adaptations and mal-adaptations such as the fattening of goats and production of charcoal both lead to deforestation and undermine the development of sustainable adaptation strategies.

The study further shows that the costs and labour requirements associated with any triple win option are crucial for the uptake by resource-poor smallholders who typically operate under climatic stress. The use of improved seed and fertilizer is the preferred adaptation option by most farmers, but the lack of income and credit are constraining their use in practice.

Assessing triple win options using a bioeconomic farm model

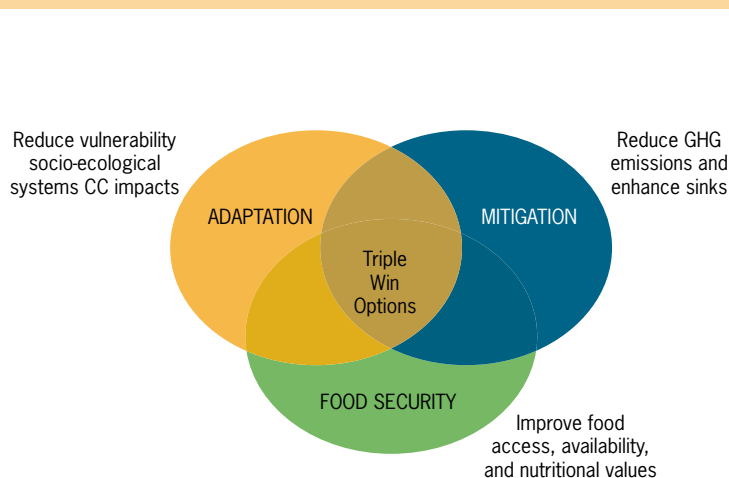
Results from the bioeconomic farm household model confirmed the critical role of labour in current rain-fed farming systems: Triple win options should aim for low labour requirements as high labour requirements may seriously limit the uptake of such options. Results also indicated at the difficulties to combine productivity growth and income growth with mitigation objectives. Agricultural productivity and income can only be increased by increasing the use of external

nitrogen fertilizers. Since currently the use of nitrogen fertilizers is very low, any improvement in crop yield and income is associated with an increase of GHG emissions. Hence, trade-offs seem unavoidable and need to be considered when choices are made.

Action research to restore wetlands

Based on the results of a stakeholder workshop in 2009, a project was started to restore the wetland buffer zone of Lake Ziway, bordering the town of Ziway and a large flower farm. An action research approach was used, i.e. together with the directly involved stakeholders, including the private sector, and plans were developed that influence land and water use and improve the robustness of the system. As the impact of current unwise use of land and water (lower water tables and water pollution) may worsen due to the effects of climate change (lower rainfall) the focus was on bank restoration and natural wetlands restoration, purifying wastewater from the flower farm, and the development of especially birding tourism to diversify the local economy. A showcase for triple win options is the development of designs to mitigate emissions from the flower farmer as a part of the entire buffer zone. Different plans were developed for the various waste water flows from this farm. The overall concept is that the solutions are based on the cleaning mechanism of artificial wetlands and fit within the current farm structure and landscape. Therefore, these solutions can be implemented relatively easily.

The Triple Win Concept



In addressing the challenge of achieving triple wins, climate-smart agriculture moves beyond conventional approaches that focus on food security, adaptation or mitigation objectives in isolation. An example of triple win are the payments made available through REDD+ that provide an alternative source of income for smallholder farmers, mitigate by increasing carbon storage, and adapt by creating opportunities to diversify and further invest in agricultural and non-agricultural incomes. Triple win options include a temporal dimension as an increase in the adaptive capacity of an agricultural system. Adjusting to climate change requires short-term strategies to cope with impacts and long-term fundamental societal and institutional change processes.

As a consequence, the triple win approach requires adjusting institutions, policies, financing and markets to strengthen capacities for transformational change of agricultural systems at various scales.

Consultative workshop: Towards climate-smart agriculture

A consultative workshop *Assessing Triple win options: Towards climate smart agriculture* was held on 29 September 2011 at Addis Ababa University, Ethiopia. The workshop aimed to discuss the importance of, and approaches to, assessing triple win options for food security, adaptation of agriculture to climate change and reduction of GHG emissions for Ethiopian agricultural programmes and policies. Specifically, the workshop aimed to formulate recommendations on how to support smallholder farmers to benefit from triple win interventions. The workshop brought together representatives and experts from the Horn of Africa Regional Environment Centre and Network and Climate Change Forum Ethiopia, as well as the Netherlands Agricultural Council in Addis Ababa and the Ministry of Agriculture and Rural Development in Ethiopia. The group of 20 participants discussed national policy initiatives such as Ethiopia's five years Growth and Transformation Plan and the Climate Change National Adaptation Programme of Action (NAPA) in the perspective of triple win options. Trade-offs among options and goals as well as the need to mainstream climate change in sectoral programmes were debated. A set of indicators considered relevant for the assessment and prioritisation of triple win options was identified and discussed. The indicators 'cost effectiveness' and 'generating smallholder farmers income' were considered 'robust' indicators being relevant to assess diverse triple win options. The participants also reviewed recent research on the impacts of climate change on local livelihoods in Ethiopia, in particular in the Central Rift Valley,



and opportunities and constraints for triple wins for food security, adaptation and mitigation (See The Triple Win Concept). Major issues in relation to support smallholder farmers in developing and benefiting from triple win options that were high lightened by the participants include:

- Adequate policy framework, in particular water pricing policies promoting more efficient water use and land tenure policies enhancing long term investments by smallholder farmers.
- Access to micro financing and micro insurance to facilitate smallholder access to new adaptation technologies.
- Support to smallholder market participation, in particular for agro-pastoralists.

Further reading

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